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**ENAMELS, PORCELAIN OR VITREOUS
TO
FERRITES**

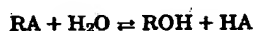
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ESTERS, ORGANIC

Esters are compounds that, on hydrolysis, yield alcohols or phenols and acids according to the equation:

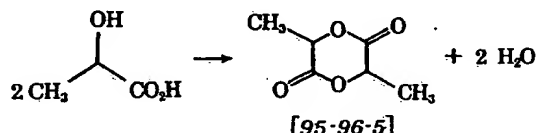


where R is a hydrocarbon fragment and A is the anionic portion of an organic or inorganic acid. For carboxylic acid esters, the reaction can be represented as:

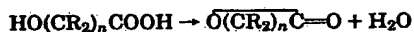


where R and R' are the same or different hydrocarbon radicals. The reverse reaction constitutes the usual method for preparing esters.

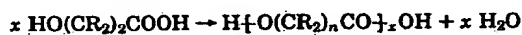
Many molecules contain both carboxy and hydroxy groups, and the specific nature of the esters formed by interaction of these groups depends largely upon the distance between them in the molecule. Aliphatic compounds that contain carboxy and hydroxy groups attached to the same carbon atom usually give a cyclic ester formed from two molecules of the compound; the reaction is illustrated for lactic acid, from which the common name, lactides, for cyclic esters of this type is derived:



When the hydroxy and carboxy groups are separated by at least two carbon atoms, internal esters, or lactones, may be formed:

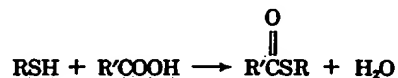


When $n = 2$ or $n \geq 5$, hydroxycarboxylic acids (qv) have a strong tendency to form polyesters by intermolecular esterification rather than lactones:



The tendency for lactone or polyester formation depends upon the chain length and upon the amount and location of branching on the carbon chain of the acid (see Polyesters). Lactones containing five or six ring atoms are usually formed to the exclusion of polyesters, whereas those with rings containing more than seven atoms are usually formed to only a small extent. Special techniques are required to prepare large lactones in good yields. Particularly when seven-membered ring formation is possible, both cyclic and linear products are formed and may be interconverted by use of heat.

Mercaptans and carboxylic acids form an analogous series of compounds, the thiol esters:



Monocarboxylic acid monoesters of polyhydric alcohols (eg, ethylene glycol and its homologues) can be prepared by the usual methods; they undergo reactions similar